tioned, there is a red clay in which calcareous organisms are nearly, if not quite, absent.

In this manner, then, it is shown that the remains of calcareous organisms are completely eliminated in the greatest depths of the ocean. For if such be not the case, why do we find all these shells at the bottom in the shallower depths, and not at all in the greater depths, although they are equally abundant on the surface at both places? There is reason to think that this solution of calcareous shells is due to the presence of carbonic acid throughout all depths of ocean water. It is well known that this substance, dissolved in water, is an energetic solvent of calcareous matter. The investigations of Buchanan and Dittmar have shown that carbonic acid exists in a free state in sea water, and in the second place, Dittmar's analyses show that deep-sea water contains more lime than surface water. This is a confirmation of the theory which regards carbonic acid as the agent concerned in the total or partial solution of the surface shells before or immediately after they reach the bottom of the ocean, and is likewise in relation with the fact that in high latitudes where fewer calcareous organisms are found at the surface, their remains are removed at lesser depths than where these organisms are in greater abundance. It is not improbable that sea water itself may have some effect in the solution of carbonate of lime, and further, that the immense pressure to which water is subjected in great depths may have an influence on its chemical activity. We await the result of further researches on this point, which have been undertaken in connection with the *Challenger* Reports. We are aware that objections have been raised to the explanation here advanced, on account of the alkalinity of sea water, but we may remark that alkalinity presents no difficulty which need be here considered (Dittmar, "Phys. Chem. *Chall.* Exp.," part i. 1884).

This interpretation permits us to explain how the remains of Diatoms and Radiolarians (surface organisms like the Foraminifera) are found in greater abundance in the red clay than in a Globigerina ooze. The action which suffices to dissolve the calcareous matter has little or no effect upon the silica, and so the siliceous shells accumulate. Nor is this view of the case opposed to the distribution of the Pteropod ooze. At first we should expect that the Foraminifera shells, being smaller, would disappear from a deposit before the Pteropod shells; but if we remember that the latter are very thin and delicate, and, for the quantity of carbonate of lime present, offer a larger surface to the action of the solvent than the thicker, though smaller, Globigerina shells, we shall see the explanation of this apparent anomaly.

(*To be continued.*)

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—The Special Board for Mathematics has reported in favour of an interval of one year being allowed between the second and the third parts of the Mathematical Tripos, instead of seven months as at present. It is also suggested that the work done in the first two parts of the Tripos has deteriorated in consequence of being held in the latter part of the Easter Term, when men are subject to many distractions.

The new buildings for the Department of Practical Botany are to be proceeded with forthwith, and thus Dr. Vines will gain the much-needed accommodation he has so long waited for.

The thanks of the University have been voted to Sir A. Gordon and to Mr. A. P. Maudslay for their presents of valuable ethnological collections, made by them in Fiji, to the new Museum of Archæology.

The eighteenth annual report of the Museums and Lecture-Rooms Syndicate draws attention to the pressing need of additional accommodation for Human and Comparative Anatomy and for Physiology. Nothing can be done to enlarge the provision of Human Anatomy till the new Chemical Laboratory is completed. A further report as to the accommodation for Physiology and Comparative Anatomy will be made shortly.

Profs. Liveing and Dewar report that additional special courses for medical students have been established. Lord Rayleigh reports that the elementary demonstrations on Physics in the Cavendish Laboratory are attended by forty students, the advanced by twenty, and the professorial lectures by from twenty to thirty students. Numerous additions of physical apparatus have been made during the year.

Prof. Lewis records a continued improvement in the Mineralogical Museum. Prof. J. P. Cooke of Harvard has presented a large and fine series of American specimens. Mr. G. Seligman of Coblentz has sent specimens far exceeding in value those for which they were exchanged. Mr. Solly brought back many excellent specimens from a tour in Norway; and the late Mr. Tawney's polariscope and optic sections have been presented by his brother.

Prof. Stuart has added some large machines to the Mechanical Department. There were sixty-one pupils in the Lent Term, and their work continues to improve. He states that Mr. Lyon's services are of extreme value as superintendent of the workshops, for he combines practical experience and theoretical knowledge in a manner rarely to be met with.

The additions to the Woodwardian Museum include twelve or fourteen thousand specimens, the collection of the late Mr. Montagu Smith, B.A., of Trinity College, a promising young student of geology, given by his parents in fulfilment of his expressed wish. They include several thousand specimens from all the crags of Norfolk and Suffolk, a rich collection of Chalk mollusca from Berkshire, mollusca from the Gault of Folkestone, the Farringdon sponge-bed, and specimens from many Jurassic localities. Mammalian remains from the Hamstead Beds, Isle of Wight, and Vertebrates from the Gault of Folkestone have been purchased. A number of interesting specimens from the Welsh Palæozoic strata, from Lower Llandoveny down to Harlech, have been added by Mr. T. Roberts. The Library continues to increase largely.

Mr. J. W. Clark reports that the collection acquired from Dr. Dohrn, exhibited at the Fisheries Exhibition, turns out much more valuable than was anticipated, there being 283 species of Invertebrates, and 38 of fishes in it, each being usually represented by several specimens. All are in first-rate order, and exceptionally good specimens. Mr. H. B. Brady has announced his intention of presenting all his valuable collections of Rhizopoda, chiefly Foraminifera, to be forwarded as the monographs relating to them are completed. Large instalments have already arrived, including the collection of British brackish-water and estuarine forms described in *Ann. and Mag. Nat. Hist.*, 1870, the North Polar Foraminifera from the Nares Expedition, the Carboniferous and Permian Foraminifera ("Pal. Soc. Monograph"), a large series of the genus Fusulina, a collection of the genera Nummulites and Orbiloides, numerous specimens of Loftusia and Parkeria, Nummulites from Egypt, and microzoic rocks illustrating the extent to which Foraminifera are concerned in the building of geological strata.

Mr. Cooke, Curator in Zoology, has catalogued and arranged the specimens of Murex, Purpura, Triton, Fasciolaria, Buccinum, Nassa, Fusus, Voluta, and Mitra, and related genera.

Mr. Hans Gadow, Strickland Curator, has been occupied in arranging the collection of birds' skins in a systematic way, and preparing to exhibit the groups in a complete manner, skins, skeletons, viscera, nests, and eggs, in juxtaposition, but want of space, cases and drawers, is a great hindrance. Valuable donations of birds' skins have been received from Major H. W. Feilden (Natal), Lady Barkly (Penang), and Mr. C. E. Lister (St. Vincent, Antilles), and in exchange from the Australian Museum, Sydney (New Guinea species).

The Morphological Department records good progress; many diagrams and models have been added owing to the liberality of Trinity College, and much valuable material has been brought by students who have visited foreign countries for purposes of morphological research. The Balfour Library is of great value, and Mr. A. J. Balfour, M.P., is defraying the cost of continuing the periodicals. Twelve students have been engaged in research; seventeen have worked in the advanced class; forty-four worked at embryology last year, while nearly fifty have worked at Elementary Morphology during the past winter. Overwhelming pressure has been put upon the department owing to the new arrangements for Elementary Biology in the M.B. examinations; 201 students entered it last term, belonging to more than one year, and no lecture-room or work-room has proved adequate for them all. The work of research, storage of material, and administration of classes are much interfered with by want of suitable rooms, and new rooms are urgently needed. A bust of Prof. Balfour, executed in bronze by Hildebrandt of Florence, has been presented to the Laboratory by Prof. Darwin and Mr. J. W. Clark.

Prof. Michael Foster reports that the teaching of Physiology has been still further developed, but has suffered somewhat from the necessary use of the Laboratory by the class of Elementary

Biology. The generous gift by an anonymous donor of 500*l.* towards new apparatus has been a great boon. A gas-engine and many valuable pieces of apparatus have been added.

Prof. Macalister states that the number of students dissecting has been nearly one hundred, and a still larger number attended the lectures on Human Anatomy. Many important specimens have been presented to the Museum of Human Anatomy by Prof. Macalister.

The Philosophical Library is increasingly used, and many valuable donations of books have been received by Mr. J. W. Clark, Prof. Humphry, Prof. Babington, Mr. D. McAlister, and Mr. Pitman of Bath.

SCIENTIFIC SERIALS

American Journal of Science, May 1884.—Remarks on Prof. Newcomb's "Rejoinder," in connection with his review of "Climate and Time," by Dr. James Croll.—Communications from the United States Geological Survey, Rocky Mountain Division, VI.—On an interesting variety of Löllingite and other minerals (one illustration), by W. F. Hillebrand. Amongst the ores analysed by the author there is one from the Missouri Mine, Park County, Colorado, which he thinks may probably be a new mineral. It is composed largely of a sulphobismuthite of copper and silver, and occurs in a quartz gangue associated with chalcopyrite and wolframite.—Notes on American earthquakes, with tabulated record of seismic disturbances in every part of the continent during the year 1883, by Prof. C. G. Rockwood.—Thermometer exposure, by H. A. Hazen. The paper is chiefly occupied with questions relating to the locality in large regions where the thermometer should be exposed in order to obtain the most trustworthy results, and to the immediate environment of the thermometer best calculated to fulfil the same requirement. There are several comparative tables of results obtained with various instruments under varying conditions of time, aspect, and altitude.—Hillocks of angular gravel and disturbed stratification associated with glacial phenomena (four illustrations), by T. C. Chamberlain. The paper deals especially with the kames or eskers analogous to the osars of Sweden, occurring in various parts of New Hampshire, Massachusetts, New York, and Wisconsin. The author infers from their inherent characteristics and their association with morainic belts, that the gravel hills in question were formed, not by beach action, but by numerous marginal streams along the edge of the great ice sheet during the Glacial period.—Extinct glaciers of the San Juan Mountains, Colorado, by R. C. Hills.—On the gender of names of varieties and subspecies in botanical nomenclature, by Asa Gray.—On secondary enlargements of feldspar fragments in certain Keweenawan sandstones (four illustrations), by C. A. Vanhise.—Principal characters of American cretaceous Pterodactyls, part i., the skull of Pteranodon (with plate), by Prof. O. C. Marsh. The skull of these Pterodactyls from the Middle Chalk, West Kansas, is described as differing from that of other known Pterosauria in the absence of teeth and of anterior nasal apertures distinct from the antorbital openings; in the presence of the elongated occipital crest; lastly, in the whole jaws, which appear to have been covered with a horny sheath, as in recent birds. All belong to the genus Pteranodon, some of the species of which were of prodigious size, with a spread of wings of about twenty-five feet. Remains of over six hundred individuals are now in the museum of Yale College.

Journal of the Russian Chemical and Physical Society, vol. xvi., fasc. 2.—On the action of the bromide of aluminium on ethylene and on the bromides of saturated hydrocarbons, by M. Gustavson.—On the specific heat of solutions, and on the thermal effects at their formation, by W. Alexeyeff. Submitting to a closer investigation those solutions which are accompanied by a lowering of temperature, the author comes to the conclusion that such is the case for those liquids which have not a chemical affinity, and that those are true solutions; while in those cases where a rise of temperature is noticed, the dissolved liquid enters into chemical combination with the dissolving one. He makes a series of very interesting experiments in order to determine the thermal effects of various solutions.—On the relations between the chemical composition and the refractive power of chemical compounds, by J. Kanonnikoff (second paper).—On the structure of nitro-compounds of the saturated series, by J. Kissel.—On the composition of the mineral waters of Caucasus, by J. Barsilovsky.—On the structure of the blue indigo, by P. Alexeyeff.—On the action of alkalies on chondrine, by M. Schwarz.—On the azocuminic acid, by P. Alexeyeff (first paper).—On chemical affinity, by A. Bazaroff.—Analysis of the epidermis attacked by the *Prosyarsis rubra*, by K. Wagner.—On the preparation of pure albumin, and on the determination of chlorine in urine, by W. Mikhailoff.—On the structure of the atmosphere and on the general laws of the theory of gases, by E. Rogovsky. The strong mathematical inquiry of the author brings him to the following conclusions:—However the atmosphere has no limits, but at a height of 1000 km. the density of air is very near to zero; its constitution varies with the height, the content of oxygen decreasing as the height increases; this change is very slow for heights less than 10,000 m., still it might be ascertained by accurate measurements; for heights less than 10,000 m. the density of air can be calculated as if it were a simple gas; the decrease of density with the height goes on slower when the temperature at the surface of the earth is higher. The paper has to be continued.—On the theory of measurements, by N. Sloughinoff.—On galvanic batteries, by P. Novikoff.

Rivista Scientifico-Industriale, March 31 and April 15.—Electric currents through contact with earth, by Prof. A. Volta.—Experiments with electrified paper, by D. Surdi.—Variations in the electric resistance of solid and pure metallic wires, with variations of temperature, by Prof. Angelo Emo.—On the Gauthier and Walrand methods of distinguishing steel from iron, by the editor.—Note on two hybrids of *Anas boschas* and *Dafila acuta*, by Dante Roster.

Rendiconti del R. Istituto Lombardo, April 3 and 17.—Programme of prize essays in various departments of Science, Art, and Letters proposed for the years 1884–91.—The Castle of Milan, its historic and artistic associations, by Prof. Giuseppe Mongeri.—On some unpublished fragments of Anatolius's Greek version of the "Codex Justinianus," by Dr. C. Ferrini.—Note on Virgil and his Italian imitator, Parini, by Prof. Cr. Fabris.—On Antonio Angeloni Barbiani and his literary productions, by E. B. Prina.—Analysis of the mineral waters of Acquarossa, Canton of Ticino, by Prof. G. Bertoni.—Malformations in the urinary ducts in Bright's disease, by Prof. C. Golgi.—Meteorological observations made at the Brera Observatory, Milan, during the month of March.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, May 1.—"Report to the Solar Physics Committee on a Comparison between Apparent Inequalities of Short Period in Sun-spot Areas and in Diurnal Temperature Ranges at Toronto and at Kew." By Balfour Stewart, M.A., LL.D., F.R.S., and William Lant Carpenter, B.A., B.Sc. Communicated to the Royal Society at the request of the Solar Physics Committee.

It has been known for some time that there is a close connection between the inequalities in the state of the sun's surface as denoted by sun-spot areas and those in terrestrial magnetism as denoted by the diurnal ranges of oscillation of the declination magnet; and moreover the observations of various meteorologists have induced us to suspect that there may likewise be a connection between solar inequalities and those in terrestrial meteorology.

This latter connection, however (assuming it to exist), is not so well established as the former, at least if we compare together inequalities of long period. It has been attempted to explain this by imagining that for long periods the state of the atmosphere as regards absorption may change in such a manner as to cloak or diminish the effects of solar variation by increasing absorption when the sun is strongest, and diminishing absorption when the sun is weakest.

On this account it seemed desirable to the authors to make a comparison of this kind between short-period inequalities, since for these the length of period could not so easily be deemed sufficient to produce a great alteration of the above nature in the state of the atmosphere.

The meteorological element selected for comparison with sun-spots was the diurnal range of atmospheric temperature, an element which presents in its variations a very strong analogy to diurnal declination-ranges.

There are two ways in which a comparison may be made between solar and terrestrial inequalities. We may take each